

Bat Records from Southeastern Virginia, Including a New Resident Species, *Myotis austroriparius* (Chiroptera: Vespertilionidae)

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INTRODUCTION

Virginia's chiropteran fauna has been documented during this century by numerous researchers (Bailey, 1946; Handley & Patton, 1947; Johnson, 1950; deRageot, 1955; Handley, 1959; Holsinger, 1964; Handley, 1979; Dalton, 1987; Padgett & Rose, 1991). Sixteen species representing eight genera were recorded from the state prior to my study.

Three bat species have been reported from Virginia based on a single record each. The most recent addition to the state's fauna is the Brazilian free-tailed bat (*Tadarida brasiliensis*) reported by Cranford & Fortune (1994) from one locality in Giles County. The yellow bat (*Lasiurus intermedius floridanus*) is known from a single pregnant female collected in 1954 at Willoughby Beach in Norfolk (deRageot, 1955). The seminole bat (*Lasiurus seminolus*) was taken on Washington Ditch at Lake Drummond, City of Suffolk, in the Great Dismal Swamp National Wildlife Refuge in 1983 (Padgett, 1987). All other bat species known to occur in Virginia are thought to be permanent residents or are common seasonally in the state.

Eleven species have been recorded from the Coastal Plain of southeastern Virginia, including *Corynorhinus* (= *Plecotus*) *rafinesquii macrotis* LeConte, *Eptesicus fuscus* (Beauvois), *Lasionycteris noctivagans* (LeConte), *Lasiurus borealis* (Müller), *Lasiurus cinereus* (Beauvois), *Lasiurus intermedius floridanus* Miller, *Lasiurus seminolus* (Rhoads), *Myotis lucifugus lucifugus* (LeConte), *Myotis septentrionalis* Trouessart (reported as *Myotis keenii*), *Nycticeius humeralis* (Rafinesque), and *Pipistrellus subflavus* (F. Cuvier) (Bailey, 1946; Handley, 1979; Padgett & Rose, 1991; D. Schwab, Virginia Department of Game and Inland Fisheries, personal communication). Several of these species (*C. r. macrotis*, *L. i. floridanus*, *L. seminolus*) are considered rare in Virginia (Roble, 1996). *Corynorhinus rafinesquii* was

formerly a candidate (Category 2) for listing under the federal Endangered Species Act, and is currently listed under state law as endangered within Virginia. The Category 2 candidate listing was abolished by the U.S. Fish and Wildlife Service in 1996 (U.S. Fish and Wildlife Service, 1996).

In 1995, the Virginia Department of Conservation and Recreation's Division of Natural Heritage obtained a contract with the U.S. Environmental Protection Agency (EPA) to conduct comparative wetland ecology studies and Natural Heritage inventories in southeastern Virginia. Concurrently, inventory projects at Fort Story Military Reservation in Virginia Beach and the proposed expansion site for the Southeast Regional Landfill in the City of Suffolk were conducted. Those species of bats considered rare in Virginia were targeted during zoological surveys conducted at these sites and others in southeastern Virginia during 1995 and 1996. The objective of this study was to obtain information on the distribution of the chiropteran fauna within southeastern Virginia, emphasizing those species considered rare in the state.

MATERIALS AND METHODS

I selected survey sites (Table 1) based on accessibility, canopy closure, flyway condition (e.g., open understory with a tunnel-like corridor), feasibility of netting, capture potential, and location. To capture bats, I used mist nets of two sizes (2.1 x 5.5 and 2.1 x 9.1 m) at all sites sampled with the exception of site 11, where visual inspection of hollow trees was the only method used. At most sites, I stacked three nets vertically using a slightly modified version of the portable mist net system described by Gardner et al. (1989). However, on several occasions when the canopy was too low, only one or two nets were used. I set nets to a maximum height of 7.6 m. over

Table 1. Location of sites, total number of net nights, number of bats captured, and dates surveyed for bats in southeastern Virginia, 1995-1996

Site	Location of site	Date(s) surveyed	Total # bats	Total # net nights
Site 1	City of Virginia Beach; Fort Story, ca. 800 m SW of East Entrance	17 July 1995	1	(2)
Site 2	City of Virginia Beach; Fort Story, ca. 700 m SW of Impact Area	18 July 1995	4	(2)
Site 3	City of Chesapeake; GDSNWR ¹ , Washington Ditch, ca. 100 m W of intersection with Jericho Ditch	17 June 1996 8 July 1996	6	(3)
Site 4	City of Chesapeake; GDSNWR ¹ , Persimmon Ditch, ca. 300 m E of Western Boundary Ditch	18 June 1996	0	(2)
Site 5	City of Chesapeake; GDSNWR ¹ , East Ditch, ca. 2.9 km N of Hudnell Ditch	19 June 1996 1 July, 1996	6	(4)
Site 6	City of Suffolk; GDSNWR ¹ , Washington Ditch, ca. 1.2 km E of Lynn Ditch	2 July 1996	3	(1)
Site 7	City of Suffolk; unnamed ditch, ca. 2.2 km SE of Nansemond	29 July 1996 29 August 1996	3	(4)
Site 8	City of Chesapeake; GDSNWR ¹ , Portsmouth Ditch, ca. 1.0 km S of Big Entry Ditch	30 July 1996	0	(1)
Site 9	Southampton County; Blackwater River, ca. 6 km N of Zuni	8 August 1996	33	(2)
Site 10	City of Virginia Beach; Mill Dam Creek, ca. 0.8 km NNE of Vine	15 August 1996	0	(3)
Site 11	Sussex County; Blackwater River, ca. 2.1 km NW of Dendron	20 September 1996	1	*

¹Great Dismal Swamp National Wildlife Refuge

* Tree cavity searches only

water-filled ditches, roads, and under the canopy of forested wetlands along river bottoms and in swamps. At each site, I tried to maximize capture success by closing off flyways as completely as possible. When favorable weather conditions existed, I operated nets from dusk to about 0100 h. Surveys conducted on 2 July at Site 6, and 8 July at Site 3 were less than three hours in duration due to inclement weather. One net night is equivalent to one net unit (1-3 nets stacked vertically = one unit) operated for greater than 2 h on a given survey date. I conducted tree cavity searches by physically entering the cavity of a tree and briefly inspecting the cavity for bats, using a head mounted electric light to illuminate the cavity.

At each site, I used a bat detector (Pettersson Elektronik AB, model D 100) to monitor bat activity at the nets and in surrounding areas. I checked nets every

15-20 minutes to minimize stress on captured animals and to reduce damage to nets. I held bats for a short period in nylon mesh bags until data collection was complete, then released them unharmed at the site of capture. I retained several individuals over night for photographic documentation. Two voucher specimens of one species (*M. austroriparius*) have been deposited in the collection of the U.S. National Museum of Natural History.

Data collected for each bat captured included species, age, sex, reproductive condition, time and height of capture in net, right forearm length, molt condition, and presence of unusual marks and ectoparasites. I used 70% isopropyl alcohol to preserve ectoparasites for subsequent identification. At each site, I collected data on habitat type, moon phase, precipitation, and other local weather parameters whenever possible.

RESULTS AND DISCUSSION

I captured fifty-six bats of six species during 24 net nights of sampling at 10 localities during 1995-96 (Tables 1,2). I resampled at three of these sites (3,5,7) to collect additional data. No bats were captured at sites 4, 8, and 10. Additionally, I collected data from a single male *C. r. macrotis* that was taken from a cavity tree at Site 11. For the purposes of discussion, comparisons with surveys conducted by Padgett & Rose (1991) are included. However, differences in methodology and study periods should be considered. Methodology used by Padgett & Rose (1991) included visual observations of flying bats and collecting with shotguns at dusk and dawn. All of their efforts were conducted from September through early June.

SPECIES ACCOUNTS:

Eastern big-eared bat - I encountered the eastern big-eared bat (*Corynorhinus r. macrotis*) three times during surveys (Table 2). A single male was captured at Site 1, using a 2.1 x 5.5 m net set over a sand road with a tree canopy of less than 3.5 m. This individual, which at the time of capture represented the northernmost known record for the species in Virginia, was netted just after 2400 hours. At Site 6, I netted a single male during a light rain at 2125 h at a height of approximately 1.3 m. This individual represents the first record of this species within the Great Dismal Swamp National Wildlife Refuge since the first Virginia record was obtained there in 1897 (Handley, 1959). At Site 11, I captured a single male in a large hollow tree in the floodplain of the

Blackwater River. This bat was roosting at a height of approximately 4 m within the cavity of a large water tupelo (*Nyssa aquatica*). The roost tree was one of over 40 trees inspected during this survey, but the only one harboring a bat. At the time of capture, this record represented the northernmost known locality for *C. r. macrotis*. Furthermore, it is only the second record from a natural roost in Virginia. Habitat at all three of these sites was bottomland cypress-gum-water tupelo swamp. The eastern big-eared bat was considered extremely rare in Virginia until recently (Handley & Schwab, 1991). *Corynorhinus r. macrotis* is now known from more than 20 records in six counties and municipalities in southeastern Virginia, although the species has not been found in abundance at any site (Clark & Williams, 1993). Additional surveys for this bat in Virginia may show it to be considerably more common and widespread than current knowledge suggests.

Big brown bat - I encountered the big brown bat (*Eptesicus fuscus*) at three of 10 sites (Table 2). I captured 5 individuals, all within bottomland swamp forest between 2100 and 0100 h. This species is common in southeastern Virginia, particularly in proximity to human habitations. Padgett & Rose (1991) recorded six individuals from the Great Dismal Swamp, several of which were shot after emerging from hollow bald cypress trees.

Eastern red bat - I captured two individuals of the eastern red bat (*Lasiurus borealis*) on 19 June 1996 at Site 5 within the Great Dismal Swamp National Wildlife Refuge. A non-reproductive male and a lactating female

Table 2. Number of bats captured and number of individuals by sex at each site in southeastern Virginia, 1995-1996.

Species / Site	<i>C. rafinesquii</i> <i>macrotis</i>	<i>Eptesicus</i> <i>fuscus</i>	<i>Lasiurus</i> <i>borealis</i>	<i>Myotis</i> <i>austroriparius</i>	<i>Nycticeius</i> <i>humeralis</i>	<i>Pipistrellus</i> <i>subflavus</i>
Site 1	1♂					
Site 2		2♂, 2♀				
Site 3				4♂, 1♀	1♂	
Site 5			1♂, 1♀	2♀	2♂	
Site 6	1♂			1♂	1♂	
Site 7		1♂			1♀	1♀
Site 9		1♂		31		1♂
Site 11	1♂					

were captured at 2215 and 2400 h, respectively. Additionally, I collected a juvenile male after it struck the windshield of our vehicle in the City of Suffolk at approximately 0230 h on 30 July 1996. This was the most commonly encountered bat during surveys within the Refuge by Padgett & Rose (1991) and it is considered to be common throughout southeastern Virginia.

Southeastern myotis - I captured four male *Myotis austroriparius* (Rhoads) on 17 June 1996, between 2140 and 0100 h at Site 3 within the Great Dismal Swamp National Wildlife Refuge. After photographing them, I released the bats the following morning at the site of capture. These individuals represent the first records of this species in Virginia and a northern range extension in the eastern portion of the species' range. The nearest published record for this species is from Wake County, North Carolina (Lee et al., 1982). However, surveys in summer 1996 documented this species in Bertie County, North Carolina (M. K. Clark, North Carolina Museum of Natural Sciences, personal communication).

I captured two lactating female *M. austroriparius* at Site 5 on 19 June 1996 at 2230 and 2300 hours, respectively. These records suggest that a maternity colony occurs within the Dismal Swamp. Further evidence of breeding by *M. austroriparius* in the Dismal Swamp was obtained with the captures of a juvenile male on 2 July 1996 at Site 6 and a post-lactating female on 8 July 1996 at Site 3 (Table 1). I retained the latter two individuals and placed them in the collection of the U.S. National Museum of Natural History (USNM 581990-91). Further investigation is warranted to determine the distribution of this bat within the Dismal Swamp.

On 8 August 1996, while setting up mist nets at Site 9, several colleagues and I heard high-pitched vocalizations coming from a large swamp tupelo (*Nyssa biflora*) at the water's edge. At the base of the tree was a keyhole-shaped opening (ca. 0.75 m high by 0.5 m wide) to a cavity which extended > 5 m upward. We counted 372 *M. austroriparius* emerging from this roost tree between 2000 and 2230 hours. We observed no bats emerging from the roost tree after 2230 hours. A mist net (2.1 x 5.5 m) was set in front of the opening, approximately 10 m from the roost tree. Another mist net (6.4 x 9.1 m) was set perpendicular to the shoreline approximately 20 m downstream of the roost tree. We captured 31 individuals (20 juveniles, 11 adults), 29 of these in the 2.1 x 5.5 m net. We opened both nets at 1930 h and monitored them for about 5.5 hours. All adults captured were females. Female *M. austroriparius* typically produce twins, a characteristic unique to this species within the genus *Myotis* (Barbour & Davis, 1969). Therefore, a conservative estimate of the number of adults

within the maternity colony would account for 124 individuals. Site 9 is currently the northernmost documented locality for this species within Virginia.

Evening bat - I captured five individuals of the evening bat (*Nycticeius humeralis*) at four sites (Table 2). All captures were below 3.0 m in height, and bats were caught between 2030 and 2300 h. This species is most likely common in the southeastern part of Virginia, but may be very uncommon west of the Blue Ridge. I recorded no captures of this species during 1992 in over 50 net nights of sampling in the Cumberland Plateau and Ridge and Valley physiographic regions of Virginia (unpublished data). Bailey (1946) lists 11 Virginia records for this species, of which 9 are from the eastern half of the state. Padgett & Rose (1991) reported this species to be second in abundance within the Dismal Swamp.

Eastern pipistrelle - I encountered the eastern pipistrelle (*Pipistrellus subflavus*) at two sampling sites during the second year of this study (Table 2). On 29 July at Site 7, I captured one post-lactating female at approximately 1.0 m in height at 2310 h. I captured a single adult male on 8 August, at approximately 3 m in height at 0030 h at Site 9. This species is most likely a common resident throughout Virginia, particularly in association with the cavernous western portion of the state. Bailey (1946) listed numerous records throughout Virginia. Dalton (1987) found this bat in 104 of 170 caves surveyed in 22 western Virginia counties, second in abundance to the little brown bat (*Myotis lucifugus*).

CONCLUSIONS

Five of the six species encountered during this study had been previously documented to occur in southeastern Virginia. This is the first documentation of the presence of *Myotis austroriparius* in Virginia. These records not only represent the northernmost range limit of the species in the mid-Atlantic region of the eastern United States, but also confirm its breeding status within Virginia. According to Gardner et al. (1992), few maternity colonies of this species have been found in non-cave structures. The colony found along the Blackwater River ranks as one of the largest found outside of a cave. The three records of *C. r. macrotis* contribute significantly to the knowledge of this species in Virginia. Of particular importance is the record from site 11 (Table 1), which at the time of capture was the northernmost documented locality and the only natural roost known in Virginia. Furthermore, the two individuals netted represent the first records of the species in Virginia outside of a roost site,

providing insight into the habitat required for foraging. These discoveries highlight the need for continued inventory efforts for bats in Virginia in the wake of new methodologies and technologies available to biologists. Additional surveys would undoubtedly provide more information on the status and distribution of each of the species known to occur in southeastern Virginia.

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Distribution and Abundance of *Cicindela dorsalis dorsalis*, the Northeastern Beach Tiger Beetle, Along the Western Shoreline of the Chesapeake Bay in Virginia

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INTRODUCTION

The disjunct historic range of *Cicindela dorsalis dorsalis* includes most of the coastal sandy beaches from New Jersey to Cape Cod and much of the eastern and western shorelines of the Chesapeake Bay from southern Maryland to Virginia (Knisley et al., 1987). Currently, this beetle is widely distributed and relatively abundant in Virginia, but only three populations occur north of Maryland, all of these in Massachusetts (Knisley & Hill, unpublished notes). Because of its dramatic decline in

range, *C. d. dorsalis* was listed as a Threatened species in 1990 under the U. S. Endangered Species Act (USFWS, 1990). Both before and after the listing there has been much survey and monitoring work to determine its distribution and abundance. However, most of this work is in unpublished reports and not readily available, except for limited distribution information in Knisley et. al. (1987).

The most extensive adult survey of *C. d. dorsalis* in Virginia was conducted by the Virginia Department of Conservation and Recreation (Division of Natural